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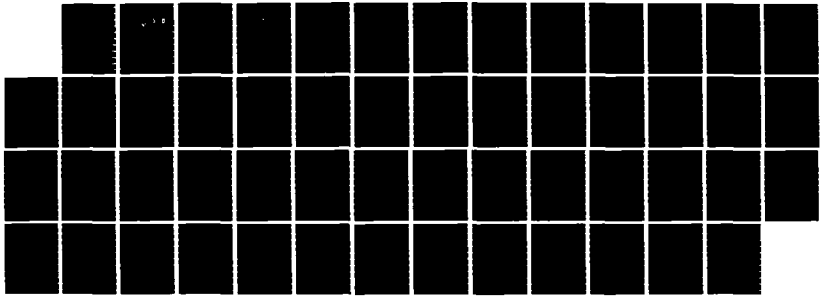

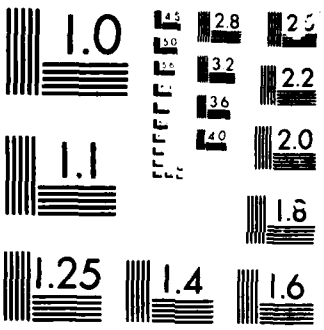
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STUDENT REPORT

EFFECT OF CURRENT RATED PERSONNEL MANAGEMENT POLICIES ON THE COMBAT CAPABILITY OF THE F-15 AIRCRAFT

MAJOR CRAIG R. DEDRICK 86-675

"insights into tomorrow"

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TITLE EFFECT OF CURRENT RATED PERSONNEL MANAGEMENT POLICIES ON THE COMBAT CAPABILITY OF THE F-15 AIRCRAFT

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The basic premise of the thesis is that the F-15 weapon system is comprised not only of hardware but also has a critical human component. As the development of the F-15 aircraft has grown at an enormous rate, there may be developing an equipment-training gap between aircraft and pilot. This study evaluates that gap and recommends a series of personnel management actions to improve the capability of the F-15 pilot in his alreacy improved F-15 aircraft.

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PREFACE

The F-15 weapons systems is composed of man and machine. This thesis examines the historical significance of flying experience in World War II, Korea and Vietnam and relates these findings to the current experience levels in our operational F-15 squadrons. The present rated personnel management process is examined relative to growing technological advancements in the aircraft.

This material is being submitted to the faculty of Troy State University in partial fulfillment of the requirements for the Masters of Science degree in Personnel Management.

The author would like to acknowledge and express his gratitude to Major John McNabb and Major William Naigle for their assistance and support.

ABOUT THE AUTHOR

Major Dedrick, an instructor pilot in the F-15, began his career at Mather AFB, California in February of 1972. A distinguished graduate of the USAF Undergraduate Navigator Training, Major Dedrick was assigned to the 15th Tactical Reconnaissance Squadron (TRS) at Kadena Air Base, Japan and in 1977 to the 17th TRS at Zweibrucken Air Base, Germany. While at Zweibrucken Air Base, he was selected to attend Undergraduate Pilot Training at Laughlin Air Force Base, Texas. Graduating in 1979 as the outstanding graduate in his class, he was assigned to Kadena Air Base flying the F-15. As a member of the 67th Tactical Fighter Squadron, he served as Standardization and Evaluation Officer and Flight Commander. In October of 1982, Major Dedrick was assigned to Clark Air Base, Republic of the Philippines serving as an F-15 instructor pilot and Assistant Operations Officer of the 1st Test Squadron. Here, at the Pacific Air Forces (PACAF) Weapon System Evaluation Program (WSEP), Major Dedrick was responsible for the creation of large force employment of live Aim-7F air-to-air missile firings, a first for PACAF. Major Dedrick holds a Bachelor of Science Degree in Mathematics from Siena College. A 1977 graduate of Squadron Officer School and currently attending Air Command and Staff College, he will serve in the office of Air Operations, J3-11, Cincpac Headquarters, Camp Smith, Hawaii. He is married and has two children.

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INTRODUCTION

OVERVIEW

"Fundamental to understanding warfighting principles is recognition of the three essential factors in warfare: man, machine, and environment. ...Man, both friend and foe, is the most complex factor and, therefore, is least understood" (14:2-4).

The warfighting principles which are germane to this thesis are those of air superiority. Of the three essential factors in warfare: man, machine, and environment, two will be discussed--the man and the machine. The primary interest will be the American F-15 air superiority pilot and how we are managing his talents. The most critical need in the modern tactical pilot force is to remain a competitive, highly skilled, experienced expert in the most technologically advanced pure air-to-air fighter in the world, the F-15 Eagle. We must not allow the human resource to be overwhelmed by the advancing technologies of the aerospace field. A balance between man and machine must be maintained. "...effective methods of modern warfare are not known instinctively; they must be learned. We learn them by training the way we will fight" (12:1-1).

Wars will be won by superior men and superior aircraft not superior aircraft alone. To accomplish our goal of the mastery of the skies, a blend of man and machine is necessary. "Men alone, or machines alone, do not spell success: how men use machines in the combat environment, and the spirit of leadership that guides that use, spell victory or defeat" (14:2-4).

THESIS AND PURPOSE

The general thesis of this paper is to determine the effects of current rated management policies on USAF combat capabilities in the air superiority role, specifically use of the F-15's capabilities.

The purpose is to examine the possibility of a growing gap between the increasing capability of the F-15 Eagle and the capability of the pilot to utilize the aircraft and its weapons systems to maximum design effectiveness. This study will establish past and present trends in two separate, but absolutely complementary areas, increased F-15 aircraft capability versus F-15 pilot capability. The expected outcomes of this report will be many realistic low to no-cost personnel management procedural improvements. These improvements will focus at the squadron to wing level and will attempt to increase the performance of what we already have--an aggressive young fighter force of F-15 pilots that can be led to the goal of maximum readiness through improved rated personnel management.

It is not the author's intent to zero-base the rated personnel management system. The system is in the hands of true

experts who are fully aware of limitations in providing a highly trained and more experienced F-15 force. "While the rated management system has undergone some iterative changes, the basic problem which that system attempted to size is still with us--how best to sustain an inventory necessary to meet requirements while retaining a credible combat posture" (15:1-4).

Neither is it the purpose of this report to separate or elevate the F-15 aircraft from the other high technology fighters in the field. Many concepts and recommendations of this study apply to some or all the major high technology weapon systems.

DEFINITIONS

The primary goal of the F-15 aircraft in the air-to-air role is air superiority. Examining three current but varying views of what air superiority is designed to achieve will help us determine when we have reached our goal. JCS Publication 1 defines air superiority as "That degree of dominance in the air battle of one force over another which permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing force" (10:21). Another view defines air superiority as "a favorable air situation, in which enemy airpower is prevented from interfering effectively with land, sea, and air operations" (18:2-3). Finally, a more limited view is taken by Secretary of Defense Weinberger in his

1985 report to Congress when he defines air superiority as "Fighter aircraft, armed with air-to-air missiles and guns, maintain control of the skies above land and naval forces, protecting them from air attack" (16:177). Although different perspectives on air superiority, all reflect a commonality of winning a surface war. If we are to win our next land or sea battle we must do it with support from our best aircraft and most experienced pilots. But who are these experienced pilots? They are pilots meeting a predescribed level of flying hours. Flying time describes an experience level in the USAF.

An experience level is a standard established by a MAJCOM given as a "minimum level of flying time either in a particular weapon system (PAA) or total rated flying time..." (15:6-2). An F-15 pilot is considered experienced having reached the MAJCOM established minimum level of flying time. The MAJCOM also sets the minimum percentage of experienced F-15 pilots which they require in their rated management structure. These levels of experience and structures of manning will be investigated in Chapter Three.

ASSUMPTIONS

A basic assumption was made in the development of this thesis. Increased exposure to the cockpit environment (flying time) yields a more capable pilot. This assumption is at the foundation of the belief that if you give a pilot more training in his primary job, the outcome of his performance will be greatly improved. This concept can be illustrated by the correlation between flying time and aircraft accident rates. As

flying time increases through the 1000 hour level the percentage of accidents drops nearly in half (9:5). Without this assumption the effects of better personnel management are mere speculation.

A further assumption is made when analyzing the historical data from previous air-to-air engagements. The question of opportunity to achieve a kill in an air-to-air conflict is not addressed in this study. Combat effectiveness is evaluated merely as the number of air kills, not the number of kills per engagement (opportunity). A presentation of the impact of the opportunity factor is detailed in the 1955 Strawbridge and Khan study Fighter Pilot Performance in Korea.

A final assumption is the positive role air-to-air tactics play in the quest for air superiority. The study of effective tactics relating to F-15 combat capability is well beyond the scope of this paper and is viewed as a positive multiplier in any discussion of the effective utilization of the F-15.

REVIEW OF THE LITERATURE

The field of literature on rated manning is plentiful. Some major contributors throughout the years show both a concern and a depth of knowledge that is quite refreshing. The review must begin with the central guidance for management of Air Force rated personnel, the Rated Management Document. This semiannual publication contains the most current information on policies affecting pilots and navigators in the United States Air Force. Another valuable document in the field of rated management is Claude C. Blanch's history of pilot performance in the air

superiority role "Air Superiority Today and Tomorrow." Finally, two documents from the corporate world show great expertise on the subject. They are the McDonnell Douglas Corporation report "Feasibility Study to Predict Combat Effectiveness for Selected Military Roles: Fighter Pilot Effectiveness" and the Rand Corporation's report "Pilot Management Policy and Training Rates."

METHOD OF RESEARCH

The method of research investigates approximately 45 years of effective use of air power and applies these general findings to the specific rated management policies of the F-15 pilot. After the Introduction, Chapter Two establishes the relationship of the man and machine through a review of historical rates of pilot success established in World War II, Korea, and Vietnam. Chapter Three studies the man in the cockpit and determines the current rated manning policies and current rated manning levels. Chapter Four shows the development of the F-15 aircraft from deployment in 1974 to present day configuration. Trends in technology plus trends in estimating military power through hardware alone will be examined. Finally, from the broad concepts of man-machine interface established in Chapters Two, Three, and Four, Chapter Five presents the specific recommendations for improving our air superiority posture within the constraints of a sensitive and volatile personnel management system.

Chapter Two

THE MAN - MACHINE EQUATION

HISTORY

A simplistic view of the three basic elements of any combat situation is given by this equation:

EQUIPMENT + TRAINING + TACTICS = EFFICIENCY IN COMBAT (18:4)

Specifically, the combat situation in which we would like to be efficient, or successful, is air superiority. Effective air superiority is achieved by maximizing each of the three basic elements: the machine through technology, the man through training, and the environment through tactics. History has shown airpower at various levels of balance depicted by the efficiency in combat equation. Different balances of man and machine has yielded marked differences in tne outcome of the U.S. battle for the skies.

Each major 20th century conflict in the history of the United States has shown some form of airpower employed. How effective this employment has been depended, to a large extent, on the quality of pilot and characteristics of the aircraft flown. The success of groups such as the American Volunteer Group (AVG) or Flying Tigers elevate the pilot, the man of the capability equation, to significant proportions. The results of these aviators' actions during the Sino-Japanese conflict are impressive. The

men of the AVG, even though ill armed as compared to the Japanese Air Force (Zero vs P-40), lost only eight pilots in seven months. During this period 297 Japanese aircraft were downed by the AVG, a ratio greater than 35 to 1 (2:70). The pilot and his superior training was the key to the Flying Tiger's success. "Chennault's training standards were so high that after four months of battle, 18 pilots were still considered not combat ready" (4:98). Pilot proficiency, not aircraft superiority, was responsible for Claire Chennault's squadron achievements. As the Flying Tigers grew in experience so did America's involvement in World War II.

Early periods of World War II led to a growth period for the American fighter pilot. Aces like Pappy Boyington received their initial experience and expertise from the AVG (1:14). As WWII progressed a small percentage of our fliers became aces. Some felt they could have done even better. Richard Bong, leading ace in the Pacific with 40 victories, estimates lack of training and skills prevented him from doubling his kills. Saburo Saki, a great Japanese ace, comments that he was able to evade certain death in the air due to a lack of basic air-to-air skills on the part of the American pilots (18:44-45). The U.S. Air Force combat capability in the air-to-air role seemed to come from a few well-trained, experienced pilots.

This trend was not confined to the Pacific.

> According to official Eighth Air Force records of the 5000 fighter pilots who flew against the Germans during 1943-1945, only a relative handful became aces. Of the 5000, only 261 (or 5.2 percent) achieved this goal. However, this small group of men accounted for 40 percent of the total 5284.5 German planes destroyed

by Eighth Air Force fighter pilots during that period; thus five percent claimed forty percent of the kills (11:1-8).

In all of World War II, four percent of the pilots in combat downed forty percent of the aircraft (5:128). The aircraft were generally comparable throughout the war. Therefore, pilot proficiency must be viewed as the discriminator.

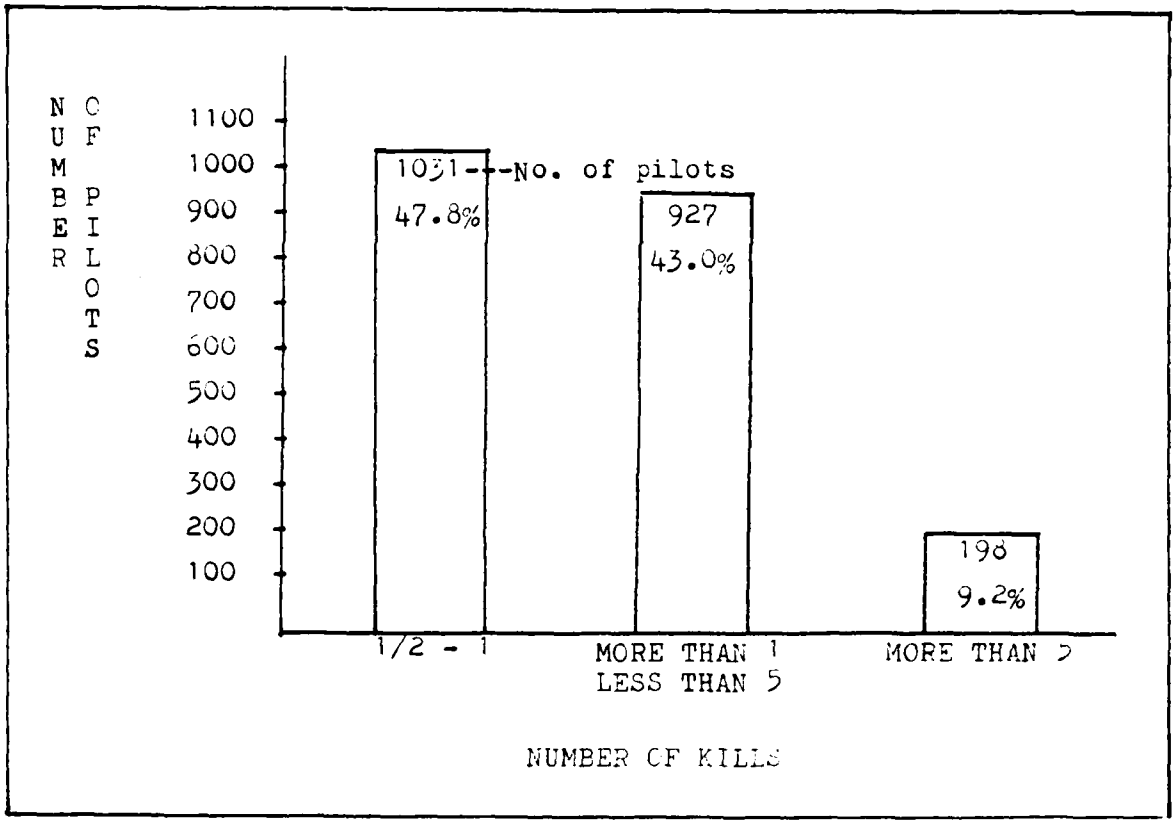

Figure 1. This figure shows the number of Eighth Air Force pilots with air-to-air kills ranging from 1/2 kill to 31 kills against the Germans in WWII (22:1-8).

The Korean War held a different balance in the equation for comparable equipment between American and Soviet made aircraft during the early 1950's. The Americans entered the Korean War

with bountiful experience from WWII. However, now flying the F-86 aircraft they faced a comparable to slightly superior performing Soviet MIG-15 aircraft. The results were unexpected. The U.S. lost only 78 aircraft while the MIG-15 fleet lost 792 (6:1189). A ratio in excess of 10 to 1 for American pilots in an equally capable aircraft. Why? Who were the aces in Korea? A group of just 38 Air Force pilots, averaging more than 2000 flying hours, each experienced with more than 80 combat missions in WWII, were our aces. Just 38 pilots shot down over 310 MIGs in Korea, 40 percent of all MIGs destroyed (18:45). The results of the air battle in the skies over Korea indicate a few well trained pilots accounted for the majority of U.S. Air Force's air-to-air kills. An experienced pilot provided the clear margin of victory, not a technologically superior aircraft.

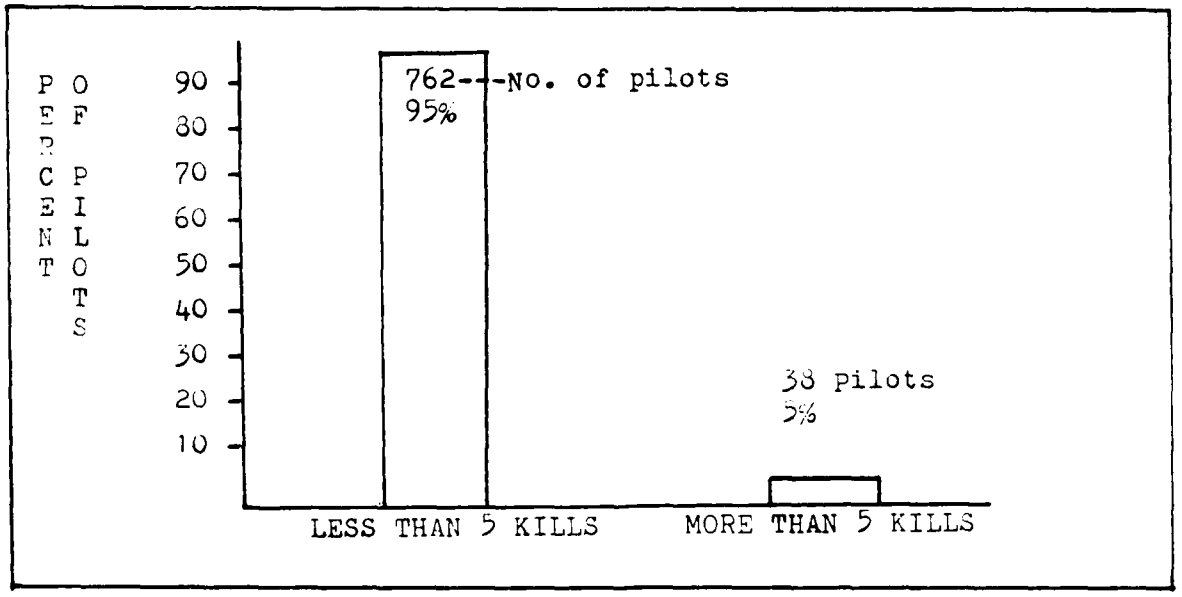

Figure 2. This figure shows Korean War MIG-15 kills for 800 USAF F-86 pilots each of whom had at least 25 counter-air missions (22:1-9).

Fifteen years later in Vietnam, the combat efficiency equation had shifted again. Proficiency in aerial combat became a problem. Diversification of mission from pure air-to-air to such tasks as nuclear delivery, conventional delivery, reconnaissance, defense suppression diluted the critical air-to-air skills. In 1966, prior to this shift from air-to-air skills, the USAF enjoyed a 3 to 1 MIG kill ratio. The demographics of a combat fighter pilot in Vietnam at that time showed 50 percent of these pilots with greater than 2000 hours flying time. More importantly, 510 of these hours were flown in the type of aircraft flown in combat (17:17-18). In just two years the experience levels changed dramatically.

"By June 1968, the average time in combat aircraft was only 240 hours and the MIG kill ratio had dropped to .85 to 1. At this time less than 30 percent of the fighter pilots in combat had had previous tactical fighter experience" (18:48). The later stages of Vietnam found the USAF lacking in the required skills for effective air-to-air combat. Part of this problem was due to poor rated manning policies such as short cockpit tours, limited time on station and lack of pilot retention. These policies led to a decline of flying experience in the late 60's and early 70's. The deficiencies were complicated by unrealistic training programs and limited challenges in flying exercises. By the late 1970's the problems had been identified and Lt Col Blanch wrote, "Much improvement had been made in training programs and today many people are striving to correct the remaining problems" (18:49). Exercises such as Red Flag and

Cope Thunder, an expanded Aggressor program and instrumented air-to-air combat ranges (ACMI) have been instituted to improve air-to-air capabilities over the last decade. The mid 1970's were the real roots of the modern air-to-air capability in the United States Air Force, both for the man and the machine. In 1974, the long awaited F-15 was about to take its place as the primary air-to-air fighter in the USAF.

KIRTLAND STUDY

With these lessons from history in mind let us examine a new perspective on the man-machine interdependency. In 1984, the Directorate of Aerospace Studies at Kirtland AFB responded to AFSC/XRLA's request for impact of aircraft, weapons and pilot performance on aircraft probabilities of survival. The methodology was to examine interactions among aircraft, weapons and pilots. Mathematical models were explored changing different variables: pilot proficiency, aircraft performance and weapons effectiveness. Three general conclusions were noted:

1. Varying pilot performance had the most effect on probability of survival and the expected number of kills.

2. The difference between good and poor pilots is accentuated by better weapons and aircraft.

3. Most performance improvement is available with improvement in pilots (19:43).

This study is in agreement with the historical performance in WWII, Korea, and Vietnam by experienced pilots. Every outcome involving experienced pilots, regardless of aircraft capability, shows a winning result. The exception to the win

record is post-1968 Vietnam. Here, with technically superior aircraft but relatively inexperienced pilots, was our first unacceptable ratio of kills. The conclusions of the Kirtland Study are supported by these historical findings.

Another more recent summary of win - loss correlations, indicating pilot skills as a factor of success, is presented in the following figure.

	MOST DECISIVE		LEAST DECISIVE		LEAST DECISIVE			MOST DECISIVE
	BEKKA VALLEY (ISRAEL)	YOM KIPPUR (ISRAEL)	KOREA (US)	VIETNAM (US)	VIETNAM (NVN)	KOREA (DPRK)	YOM KIPPUR (EGYPT/SYRIA)	BEKKA VALLEY (SYRIA)
LOSS EXCHANGE RATIO	80+ KILLS NO LOSSES	21:1	10.6:1	2.6:1	1:2.6	1:10.6	1:21	NO KILLS 9+ LOSSES
SUPERIOR PILOT SKILLS	YES	YES	YES	YES	NO	NO	NO	NO
WEAPON EFFECTIVENESS	YES	YES	YES	MARGINAL	NO	NO	NO	NO
AGGRESSIVE TACTICS	YES	YES	YES	NO	NO	NO	YES	NO
SITUATION AWARENESS	YES	YES	YES	FAIR	YES	YES	YES	NO
PERFORMANCE SUPERIORITY	YES	NO	NO	NO	YES	YES	YES	NO
NUMERICAL SUPERIORITY	NO	NO	NO	YES	NO	YES	YES	YES
		WIN				LOSS		

Figure 3. Win - Loss Correlations (19:49).

It is interesting to note that the qualifier of superior pilot skills appears exclusively on the win side of this table. Other than situational awareness, which is certainly a characteristic of a more experienced pilot, pilot skill is the only factor that is uniformly consistent as a determining winning factor. "Mr. Chaput concluded the influence of technically related discriminators typically came to bear on the magnitude of defeat or victory, but did not spell the outcome of the battle" (19:48).

CONGRESSIONAL BUDGET OFFICE

A final look at different perspectives on the man-machine equation brings us to a report by the Congressional Budget Office (CBO). In April of 1985, the CBO published a detailed summary of the Administration's current tactical aircraft plans in terms of cost and modernization. Different methods of achieving a 40 wing Tactical Air Force were analyzed in this study.

The administration has three major goals for the tactical forces of the USAF over the next five years. They are, first, to build a force structure to 40 air wings by 1991; second, to modernize the fleet with new versions of F-15 and F-16 aircraft; and finally, to retire old F-4 aircraft at about 20 years of age (13:xi). The Congressional Budget Office states that the program would substantially improve tactical airpower yielding a 32 percent increase over 1985 levels of air-to-air capability (13:xii). Admittedly, their study omits the man and gives only

the machine element of the man-machine balance. Their model takes a narrow view yielding to certain shortcomings. "The model has important limitations, however, including some subjectivity and omission of certain factors, such as strategy, tactics, leadership, luck and pilot performance..." (13:xii). Excluded from this study by a major actor in developing U.S. force structure, the CBO, is pilot performance. This has been the trend, not the exception, and remains a potent, yet neglected, force in a complete approach to tactical airpower. "The human element is pervasive in the combat equation, but for some inexplicable reason the Air Force emphasis often downplays the importance of the man while stressing the importance of equipment" (18:79). Pilot experience levels, being difficult to quantify, remain near the bottom of funding issues. This approach has produced, in larger proportions than ever before, an experience - training gap in the modern tactical air-to-air forces (18:42).

EQUIPMENT - TRAINING GAP

The Congressional Budget Office's study is just another illustration of a lack of understanding of the growing imbalance between the man and the machine in high technology air superiority fighters. History has delivered us a lesson that highly trained, experienced pilots, even flying inferior aircraft, can significantly outperform a superior aircraft flown by inferior pilots. The mathematical models of the Kirtland Study bear this out. The air battles of the 80's over the Bekka

Valley attest to the lethality of U.S. made aircraft. The real question remains whether the human factor, the skill and proficiency level of the American fighter pilot, will keep pace with a dramatically increasing rise in aircraft technology and an ever increasing Soviet threat to meet our advancements. To visualize this, let us look at a model used by Lt Col Blanch in 1976:

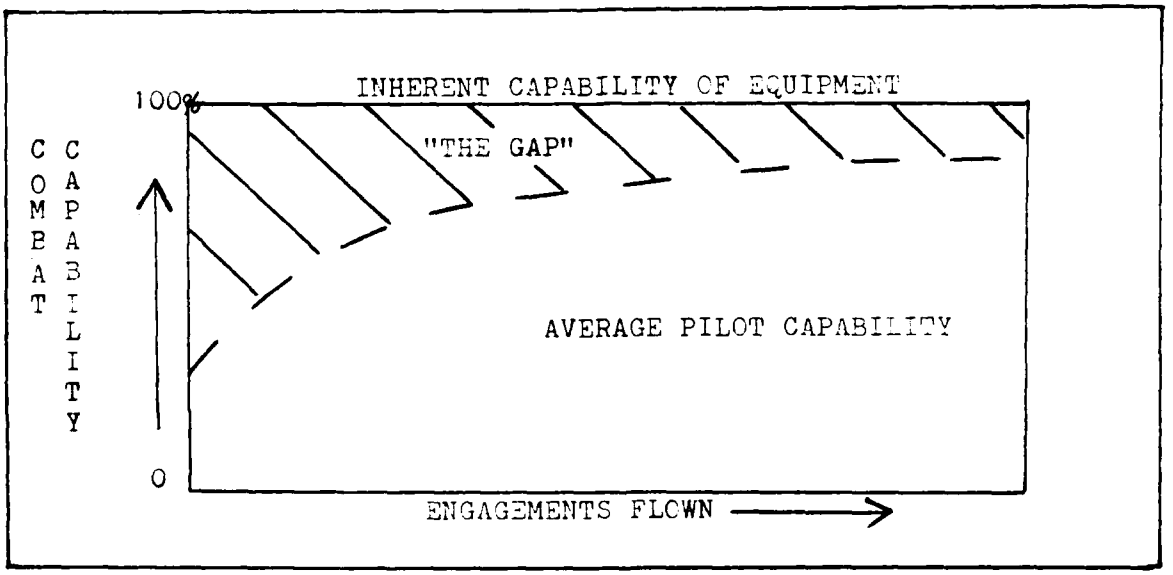

Figure 4. Model of Equipment - Training Gap (10:43)

On the advent of the F-15 entering the air superiority role, Lt Col Blanch stated the following:

> The equipment - training gap referred to is a matter of degree, time and circumstance. The pertinent questions are: How big is it? Does it seriously degrade air-to-air combat capabilities? What can the Air Force, in today's austere environment, do to minimize it? (18:43).

These thoughts have guided this study in a search for the balance of man and machine in the 1980's. To answer the question of what is the equipment - training gap in the F-15 weapon system in the 1980's several questions will be discussed. Of primary concern are the current U.S. Air Force rated manning levels and management policies relative to the F-15 pilot. Additionally, how have technological advancements in the F-15 affected the rated management policies? Finally, what recommendations would aid in closing this equipment - training gap?

Chapter Three

THE MAN

USAF MANAGEMENT PROCESS

"The rated management system exists to provide sound analysis of options and their potential impact on the rated force in a continuing effort to balance out year force development with the maintenance of a credible, combat ready fighting force" (15:1-4). The evolution of our current rated management system can best be described as implementation based on today's needs and tomorrow's forecasts. Since 1973, the rated management process has evolved through forums such as the Rated Management Committee, the 1975 Rated Distribution and Training Management (RDTM) concept, the Rated Management Initiatives Group (RMIG) in 1976, a Rated Management Planning Group (RMPG) in 1979 and, beginning in 1982, a bi-annual Rated Management Executive Conference which established the present day Rated Management Document (15:1-1 - 1-4).

The basic guidance driving the processes contained in the Rated Management Document (RMD) is readiness and sustainability. Our fighting forces must be maintained at the highest levels of experience possible, while still allowing a training process to exist. Sustainability, through an on-going training process, will ensure a continued flow of replacements for the combat

squadrons. Let us now examine some of the major issues that have challenged the smooth development of a credible, experienced F-15 fighter force during the 1980's.

Today's challenges for managing a rated fighter force are basically twofold: absorption and experience levels. Absorption can best be defined as the number of cockpit seats (authorizations) available to the new pilot graduates or other major weapon systems graduates, divided by the rate at which these new inputs are allowed to flow through these cockpits (15:6-1). More important perhaps is the absorption capacity, the maximum number of pilots a weapon system, here the F-15, may accept and not drop below a constraining factor, such as experience level.

The vehicle for maintaining this delicate balance between absorption capacity and experience level is the Air Force Manpower and Personnel Center's Consolidated Absorption Analysis Model (CAAM). This model is not limited to just experience level determination but incorporates "some 55 independent and 114 dependent variables utilized in calculating maximum absorption" (15:6-3). The CAAM develops the baseline, guided by the criteria of experience level, weapon system stability or copilot manning, which yields the maximum absorption capacity for a major weapon system.

RATED MANAGEMENT METHODOLOGY

The CAAM methodology is quite valuable and will produce the optimum mix of new pilots for any weapon system. However, the utility of such a system is greatly influenced by the disciplines to which it is programmed. The major commands, as stated in Chapter One, determine the defining criteria for experience levels. "Inasmuch as the utility of CAAM is totally dependent on MAJCOM determined criteria, it is incumbent on the MAJCOMs to continually update the data base" (15:6-5). Here is the key factor in the maintenance of a level of experience in today's F-15 squadron. The MAJCOM defines the criteria, the CAAM analyses the inputs and Air Force Manpower and Personnel Center (AFMPC) structure the product. MAJCOM inputs are the foundation.

F-15 EXPERIENCE LEVELS

The MAJCOM definition of an experienced F-15 pilot is the same in all the commands. An experienced F-15 pilot is defined in terms of flying hours as "1000 FP,IP/300 PAA, or 500 PAA or 200 PAA/600 previous tactical fighters or 100 PAA previously experienced" (15:6-11). Simply stated, to be experienced in the F-15 aircraft you must have 500 hours in the F-15, or 300 hours in the F-15 and 1000 hours of first pilot or instructor pilot time. A second way to be considered experienced in the Eagle is to have 200 hours flying time in the F-15 and 600 hours of other tactical fighter time. The final method for being designated an experienced F-15 pilot is flying 100 hours in the F-15 and having been previously experienced in another fighter.

Therefore, the maximum F-15 time needed to be experienced in the F-15 is 500 hours, while the minimum is just 100 hours.

A snapshot of the level of experience maintained at four separate operational F-15 wings was obtained during 1985. Data was collected from each wing training shop on 435 operational F-15 pilots to determine total fighter time and total F-15 time. This data is compared to the 1979 experience analysis data briefed at the October 12, 1979 TAC Commanders Conference (20:27-28).

ALL FLYING TIME	1979	1985
Less than 500 hours	51%	40%
500 - 1000 hours	20%	22%
1000 - 1500 hours	8%	13%
Over 1500 hours	21%	25%

TABLE 1. Percent of F-15 Pilot Force by Total Flying Time

Note: 1979 data based on 236 TAC F-15 pilots.

F-15 FLYING TIME	1985
Less than 500 hours	64%
500 - 1000 hours	29%
1000 - 1500 hours	6%
Over 1500 hours	1%

TABLE 2. Percent of F-15 Pilot Force by F-15 Flying Time

Note: 1985 data based on 435 TAF F-15 pilots.

When adjusted for the definition of experience, to include other fighter time, the experience level for the F-15 community in TAC in 1979 was 60% (20:26). The experience level as last reported by AFMPC in 1984 (TAF-wide) was 49%. Both figures are well above the Air Force minimum of 40% (15:6-22). When total flying time is included in the experience level of the F-15 pilot, the Air Force is exceeding standards. We have better than a 60%/40% mix of inexperienced/experienced F-15 pilots. However, when just F-15 time is viewed as a function of experience, things don't look quite as favorable. A substantial drop-off occurs at the 1000 hour point for F-15 time. Only seven percent of our operational F-15 force has more than 1000 hours in the F-15. With approximately two thirds of all our F-15 pilots possessing less than 500 hours in the aircraft in which they will perform combat, the question must be asked: does our definition of experience really indicate an experienced F-15 fighter force?

The lessons from aviation history have revealed the following concerning an experienced pilot force:

1. Chennault's Flying Tiger's success was guided by strong training programs and high levels of experience.

2. In WWII, 40% of all enemy aircraft were downed by an experienced cadre of just 4% of the pilots.

3. Of the 38 USAF aces in Korea, they collectively averaged over 2000 hours, each with 80 previous combat missions.

4. Pre 1968 Vietnam, 50% of the fighter pilots averaged over 500 hours in their current aircraft and achieved a 3 to 1 kill ratio.

5. Post 1968 Vietnam, the average pilot had 240 hours in the aircraft flown and the kill ratio dropped to .85 to 1.

In each example, pilot performance depended on a high level of experience. W.A. Stewart reports that true experience might be found at a much higher level of flying time:

> Fighter pilot performance data from gunnery and dive-bombing meets suggest, as one would expect, that performance is correlated with experience, measured in flying hours. Analysis of the results of the 1953 Far Eastern Air Forces Gunnery Meet, for example, pointed to important differences in pilot dive-bombing accuracy on both sides of 1500 hours in flying experience (which normally falls in the fifth year of cockpit service) (21:12).

Yet our operational F-15 squadrons are shown to exceed experience standards with 64% of the F-15 pilots having less than 500 F-15 hours and 93% having less than 1000 F-15 hours. This must lead us to at least an identification of a problem. That problem may be our current definition of "experience".

Some thought has been given to redefining the MAJCOM statement of an experienced F-15 pilot. In a January 1985 Functional Management Inspection of 19 Tactical Air Command (TAC) units, the message was: "Supervisors in some units stated that the 500 hour PAA time criteria for becoming experienced may be too soon in light of weapons system complexity and shorter calendar time required at the current UTE (utilization) rates" (11:15).

The response was a recognition that a static definition of experience level needs to be responsive to a rapidly improving weapons system. Headquarters TAC was tasked to: "Review fighter force management policies and attempt to reduce manning turbulence and increase TOS (time on station), particularly in operational units" (11:15). In fact, it was determined that: "The 40% experienced/60% inexperienced objective may not be appropriate in light of current UTE rates and TOS in operational units" (11:15).

The problem facing these squadrons may be a lack of truly qualified pilots rather than an AF Manual 51-50 experienced pilot. Some contributing factors identified by this Functional Management Inspection Report adding to the experience level problem are low time on station, the cost of flying hours, pilot retention factors and excess training commitments (over-absorption) (11:6-17). All these factors are the focus of some creative rated manning initiatives being pursued by AFMPC at the present time.

CURRENT MANNING INITIATIVES

The manning of the overall F-15 operational community reveals a serious lack of in-aircraft experience (93% of the F-15 pilots with less than 1000 hours F-15 flying time). Through instruments like the Functional Management Inspections and Rated Management Executive Conference the problems have at least been identified. The Rated Management Document identifies five areas that specifically apply to rated management policies of the F-15

pilot. Each of these initiatives will contribute to the overall readiness of each of our combat air-to-air squadrons.

1. The goal of a 40%/60% experienced to inexperienced pilot ratio will be increased to a 50%/50% ratio.

2. The stability of an assignment at the operational fighter base will be increased from the present 2.4 years to 2.8 years.

3. Commitment of a new pilot training graduate will be seven years vice six.

4. The rate of absorption of new pilots will be slowed.

5. Training commitments will be reduced yielding not greater than 25% of aircraft (and resulting pilot staff) devoted to this non-combat function (15:2-3 - 2-4, 13-1). These important manning procedures are intended to increase experience levels at the operational squadron level without completely disrupting the various non-operational requirements for rated pilots such as Air Training Command Instructor or Fighter Lead-In Instructor duties. A combined effort of personnel stability and increased cockpit exposure through longer time in actual flying duties, UTE rate increases and expansion of the flying hour program are being initiated. This will gradually enhance true experience levels in the operational squadrons (15:2-3 - 2-4).

To summarize, the man of the man-machine equation has continued through the 1980's at a level of experience above the MAJCOM directed levels. However, if experience is viewed as a function of actual F-15 flying time, then based on some of the

lessons from previous air wars the situation is in need of serious attention. The concern has reached the commanders and the personnel managers. Are these current initiatives sufficient? Will they produce enough strength on the human side of the man-machine balance? Let us examine the machine, the F-15 aircraft, to judge the pace at which we must improve our pilot skill levels.

Chapter Four

CAPABILITIES OF MAN AND MACHINE

EVOLUTION OF THE F-15

"To retain our qualitative edge in this area (tactical air), we must continue to improve our tactical aircraft inventory. To that end, we are acquiring systems that will allow for rapid, multiple engagements beyond visual range, while being highly maneuverable and lethal at close-in ranges" (16:39).

The F-15 Eagle, first delivered to the Tactical Air Command on November 14, 1974, is the first air superiority fighter to originate from USAF requirements since the F-86 Sabre produced in 1948 (3:4,42). Although some early initiatives were begun as a Concept Formulation Study in 1965, a serious attempt to identify a true air superiority fighter was not established until August 1967 with McDonnell Aircraft Company and General Dynamics in competition. The true impetus for the birth of the Eagle can be traced to a Russian airfield at Domodedova, where in July 1967 the Mikoyan-Gurevich MIG-23 Flogger and MIG-25 Foxbat were unveiled. These were the current Soviet threats, the F-15 Eagle would be the counter to those threats seven years later (3:4,5,42).

The F-15 has meet the challenges of the Soviet air threat throughout the 1970's and 1980's. The F-15 was built as a high-performance, supersonic, all-weather air superiority fighter optimized for the counter-air mission. According to the Development Concept Paper (DCP) for the F-15, its most difficult role would be where "the counter-air fighter must protect the strike force from enemy fighters while under the GCI network and exposed to potential attack from his fighters, SAM and AAA" (3:6).

To minimize these difficulties the F-15 aircraft has undergone almost constant modification to upgrade its effectiveness in the combat arena. Each technical improvement has demanded the pilot be more proficient, better prepared and more knowledgeable of the use and employment of these sophisticated aircraft systems.

The initial operational F-15 Eagle squadron received its first F-15A aircraft at Langley AFB on January 9, 1976 (3:13). By February 27, 1979, the first F-15C aircraft flew displaying such improvements as: an improved APG-63 radar using a programmable signal processor (PSP), an increased internal fuel capacity of 2000 pounds, and the ability to accept two conformal Fuel and Sensor Tactical (FAST) packs. An aggressive initiative called Multi-stage Improvement Program (MSIP) began to modify the F-15C in 1983 (3:13). The major components that will be improved by MSIP over the next six years are: the installation of a Track-While-Scan radar, an Advanced Medium Range Air-to-Air Missile (AMRAAM) capability with multi-shot (guidance of more than one

missile simultaneously), a greatly expanded central computer which "stores four times more information than the current computer in the F-15 and processes data three times faster" (8:25), improved electronic Counter-Counter measures, programmable weapon stations for the AIM-7M missiles, Chaff and Flare launchers, split screen VTR, improved inertial navigation system and finally, improved battle management through the Joint Tactical Information Distribution System (JTIDS) (23:10).

The Joint Tactical Information Distribution System alone is a very "pilot-intense" improvement.

> JTIDS will provide USAF/McDonnell Douglas F-15 pilots with a global display of the local air battle situation, including both enemy and friendly aircraft far beyond range of his airborne radar and behind own-aircraft, obtained from airborne warning and control system aircraft and ground-based command centers and sensors (7:100).

All these improvements, modifications and expansions of the ability of the F-15 aircraft put a tremendous burden on the pilot of this single seat fighter. His training and experience level will determine the true worth of these futuristic systems bundled in the airframe of the F-15 Eagle. We must include the proficiency and true experience levels of our F-15 pilots in any capability determination, but we don't. The Congressional Budget Office, as mentioned in Chapter Two, gives a qualitative evaluation of our airpower capability through a system called Technique for Assessing Comparative Force Modernization (TASCFORM) (13:34).

MODEL OF POTENTIAL CAPABILITY

The Machine

Improved capability estimates are provided the Congress of the United States in part through studies done by the Congressional Budget Office. A current estimate of improved capability provided by continued purchase of the F-15C are based on a methodology developed by the Analytic Sciences Corporation (TASC) (13:73). The Technique for Assessing Comparative Force Modernization evaluates each aircraft "by comparing the capabilities inherent in its airframe and engines to those of the F-4B" (13:74). The following steps are then taken to arrive at a comparative estimate.

1. Estimate basic airframe performance for each mission the plane performs.

2. Adjust airframe performance for the system that the plane carries such as weapons enhancements, navigation and survivability.

3. Adjust for the number of sorties that the plane can perform.

4. Produce a composite figure for each mission.

5. Depreciate composite score.

6. Reflect size and composition of the aircraft inventory.

Multiply scores by numbers of each type of aircraft in the inventory (13:38).

A relative ranking is produced which:

> ...provides static indicators of performance potential rather than dynamic measures of effectiveness. As the outcome of a battle is as likely to be affected by performance potential of its pilots as of its aircraft, as well as other factors, TASCFORM could be said to overemphasize hardware" (13:74-75).

The following chart places the F-15C as the most potentially capable aircraft in our current inventory.

AIRCRAFT	FIGHTER/INTERCEPTOR
F-4C/D	9.8
F-4E	11.4
F-4E(MOD)	16.7
F-15A/B	15.7
F-15C/D	20.3
F-16A/B	14.2
F-16C/D	14.0

TABLE 3. TASCFORM Adjusted Aircraft System Performance Figures (13:75).

The fact that budgets and future programs, well into the 1990's, place the F-15C at the top of our air-to-air defense system but exclude pilot capability from the methodology places a greater responsibility on the entire rated personnel management system to provide the most experienced and capable pilot in the F-15 Eagle. We have literally bet our budgets on the Eagle doing its job. The following figures indicate the enormous investment America has placed in the F-15 hardware.

	FY 84	FY 85	FY 86
F-15			
Procurement			
Quantity	36	42	48
$ Millions	1514.5	2066.2	2209.1

TABLE 4. Secretary of Defense Proposal (16:184)

The Man

Exhaustive studies have been done analyzing the various traits that combine to make a successful air-to-air fighter pilot. A profile of the effective fighter pilot has been developed in a 1977 feasibility study conducted by the McDonnell Douglas Astronautics Company. Inputs to the data were developed from five scientific studies, reports of foreign aviation programs and analysis of U.S. pilot opinions.

A comparison of the current USAF pilot selection system to the significant findings examined in this report indicate several areas which are related to success as a fighter pilot. The McDonnell Douglas report finds the USAF system of pilot selection deficient in pilot training testing in the following characteristics and critical skills: willingness to take calculated risks, performance under stress, emotional control, motor coordination, visual perception, aggressiveness, self-confidence, physical and combat leadership, interpersonal

rating, determination, self-discipline, flight skills, equipment knowledge and aerial gunnery (22:4-13). None of these areas are currently tested as a determining characteristic of success for a future fighter pilot. A considerable number, however, are implemented in the pilot selection process of the Israeli Air Force (22:4-4). For example, pilot training candidates of the Israeli Air Force are selectively screened on the basis of physical and mental aptitudes plus extensive psychological testing. Aggressiveness and the ability to handle severe stress are some of the most important factors evaluated (18:63).

This extensive study done by the McDonnell Douglas Corporation identified 33 variables that reflect valid indicators of an effective combat fighter pilot. It was a principal finding of the McDonnell Douglas study that the United States Air Force could and should test for these characteristics during initial acceptance selection for pilot training. A program similar to the current Israeli pilot testing program was envisioned. The top ten of these effective combat fighter pilot traits that can be identified by current hypothesized predictor variable tests are: aggressiveness, self confidence, courage, responsibility for men in combat, physical and combat leadership, self discipline, performance under stress, emotional control, ability to withstand psychological stress and anxiety tolerance (22:1-3 - 1-4). Perhaps this remark by a WWII ace concerning the other aces of the war best sums up the true purpose of an accurate selection system: "I remember very

clearly one of our leading aces saying on the radio during a rather large hassle, 'I've got about six of 'em cornered back here!' That, to me, is a graphic demonstration of the spirit and guts that it takes to make an ace" (22:3-100). Spirit and guts were not all it took to be among the top aces of the war. One skill seems to be predominant among aces, that of aviation skill.

Of all the characteristics involved in this study, aviation skill was considered the most critical. "...Pilots leaving Korea rated knowledge of equipment and flying ability as skills of the best fighter pilots..." (22:4-11). If we are to effectively man our F-15 squadrons with the best pilots available, a screening process to evaluate certain significant characteristics of a successful fighter pilot must be implemented. The characteristics identified in the McDonnell Douglas study and the system employed by the Israeli Air Force may be an excellent place to begin.

TRENDS IN F-15 WEAPONS SYSTEM MANAGEMENT

The F-15 as a weapons system must be thought of as both a machine and a man. However, unlike new initiatives in designing a logistics system that treats the F-15 as a complete weapons system, a capabilities view of the Eagle still separates the technology in the machine from the experience in the cockpit.

The 1980's is a decade of incredible technological improvements in the F-15. Rapid advancements are now being implemented in such systems as Track-While-Scan, AMRAAM, Joint

Tactical Information Distribution System and a central computer of four-fold storage and processing at three times the previous rate.

The rapid advancement is being sold to Congress. Budgets and funding levels are determined by this estimated capability enhancement. However, due to the TASCFORM methodology, the pilot factor is not considered. A critical assumption is made that pilot proficiency is keeping pace with the rush of rapid technological improvements.

Finally, studies have indicated that certain factors are significant when choosing a candidate for pilot training if the desired result is a successful fighter pilot. Critical among the long list of skills for pilot selection are aviation skills, aircraft system knowledge, aggressiveness, self confidence and courage.

The capabilities of man and machine must proceed on an equal and parallel course if we are to obtain the expected combat capability from the weapons system called the F-15 Eagle. Personnel management procedures involved in providing the experience levels in a particular weapon system must grow along with the aircraft itself. If the combat capability of the machine is continually improved through modifications and additions, then too must the capability of the pilot be equally nurtured through improved personnel management procedures. Many initiatives have recently been implemented but more are needed. The goal must be the most highly experienced fighter pilot in the more complex and sophisticated fighters. The following are some

conclusions, recommendations and findings for improving the combat capability of the F-15 fighting force within the constraints of an already taut personnel management system.

Chapter Five

SUMMARY

The question of how has combat capability in the F-15 Eagle been affected by current rated management policies has been an intriguing subject to quantify. This study has related previous levels of flying experience in World War II, Korea and Vietnam to current experience at the operational F-15 squadron level. By the end of 1984, the operational F-15 pilot's level of experience had improved in total time over the last five years. The rated management policies towards the F-15 pilot during the 1980's have positively affected the combat capability of this weapon system. However, the F-15 pilot is seriously deficient in F-15 flying time as compared to successful fighter pilots of the past. In the absolute sense, the rated management policies of the last five years have improved the capability of the F-15 weapons system. Relatively, however, the balance between the pilot's capability and the aircraft's improvements has accelerated more in the technological advancements of the aircraft rather than the personnel advancements of the man.

The concept of man - machine as an integrated weapon system, consistent throughout this thesis, emphasized the need for better weapons system management on the personnel management level. Better care is needed in developing, training and maintaining our F-15 pilot force. Current manning policies are meeting baseline

requirements, however, improvements in these policies should be a high priority for the rest of the 1980's in order to realize maximum potential from our numerically inferior but technologically superior F-15 fighter force.

The following conclusions, recommendations and findings are intended as an aid in improving the combat capability of the F-15 Eagle. Time to concentrate on the primary duties of piloting an airplane may be the only implication of some. They are meant as a basis for creative thought from the squadron supervisor level to the future system planners of the Air Force, both in the aircraft and personnel fields.

CONCLUSIONS

1. World War II, Korea and Vietnam flying results indicate that experience in the type of aircraft flown is of critical importance to the outcome of the air battle. The F-15 fighter force is lacking in F-15 hours flown.

2. Only a small portion of our World War II and Korean War pilots became aces. These successful pilots were the most highly experienced in both total hours and hours in type aircraft flown. Our F-15 force is small but qualitatively superior. We must ensure that the percent of successful pilots, in the next conflict, remains high by keeping our F-15 experience level high.

3. The F-15 aircraft technology is increasing at such a rapid pace that increased levels of creative management of our human resource are necessary. As the machine improves through technological advancement, so too must the pilot advance through

personnel management policies that recognize the need for specialized skills requiring intense continuous training.

4. The current trend in aircraft capability analysis is to overemphasize hardware. Emphasis must be placed on the complete weapon system of the man and machine when evaluating our warfighting capabilities.

5. Current average F-15 flying time in the operational units is 410 hours. Although current manning levels show 49% of the squadron pilots as experienced, 93% have less than 1000 hours in the F-15 aircraft. Increased flying experience is needed at the operational squadron level. This may be done by increased time on station and slowing the absorption rate.

6. Current rated management policy is gradually improving the combat capability of the F-15 weapon system by increasing squadron experience levels. These efforts, however, may be outpaced by demands upon the pilots due to rapidly advancing aircraft systems technology.

RECOMMENDATIONS

1. Adjust the Consolidated Absorption Analysis Model (CAAM) to reflect an increased F-15 flying hour level needed to be considered experienced in the F-15 aircraft. MAJCOMs should adjust their definitions of experience to reflect a need for greater in-aircraft flying hours.

2. Pursue the goal of 2.8 years on station as a minimum for operational F-15 squadron pilots. Fighter wings should maintain

the current pilot sortie rate of approximately 15 sorties per month.

3. Incorporate pilot screening factors, as suggested by the McDonnell Douglas study, into the pilot selection program. The pilot selection process should be expanded, not only to include this psychological screening, but to also include physical and mental aptitude testing.

FINDINGS

Other suggestions found during the research of the experience level question, while not within the scope of this study, may merit some further investigation:

1. Offer a non-credit Fighter Weapons School Course at the fighter squadron level. This could be accomplished by a TDY instructor team or a correspondence course producing a concentrated, time-sensitive exposure to critical flying skills.

2. Augment the Replacement Training Unit F-15 instructor pilots with F-15 pilots from the Air National Guard units. As Air National Guard units are equipped with the F-15 aircraft, instructors from these Air National Guard units should augment the active duty F-15 instructors. Current active duty instructors could then be returned to the operational squadrons adding to needed experience levels.

3. Initiate an aviation history program or accredited master's program at the squadron level. A source of military aviation history will provide a basis for increased creative thought in areas such as tactics, strategy and doctrine.

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